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# **Understanding Consumer Behaviour to Develop Competitive Advantage: A Case Study Exploring the Attitudes of German Consumers towards Fruits with Cosmetic Flaws**

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## **Abstract**

Worldwide, there is a great contradiction when it comes to food waste. On the one hand, it is estimated that up to 40 % of the globally produced food is lost or wasted every year, on the other hand about 925 million people suffer from malnutrition. In addition, food production has to be increased by 70 % to feed a population of 9 billion people in 2050. Due to these estimations, it becomes increasingly important to start initiatives to reduce food waste and its impact on natural resources. One reason why fruits and vegetables are wasted in developed countries is aesthetic standards set by retailers.

Aesthetic standards regulate the shape and appearance of fruits and vegetables. Retailers have set these standards based on the assumption that consumers are only willing to buy fruits and vegetables without any cosmetic flaws. The result is that produce which are misshapen are sorted out in advance and go to waste. Within this context, this paper has two main objectives: first, to explore the attitudes of consumers towards fruits and vegetables with cosmetic flaws; and second, to unveil how these attitudes influence consumers' purchase intentions.

A survey was conducted for this research in order to investigate whether this food waste is avoidable or not. A total of 213 participants from Germany took part in the survey. The results of this research indicate that consumers in Germany are potentially willing to buy misshaped

fruits and vegetables and have a positive attitude towards them. However, the degree of willingness and the attitude of consumers depend on the price of the product and on the type of cosmetic flaw. Based on the assumption that consumers are willing to buy misshaped fruits and vegetables, retailers have the possibility to take responsibility and ease their aesthetic standards for an additional offer of misshaped products. This Corporate Social Responsibility (CSR) initiative would create environmental and social benefits as well as economic benefits for the retail sector.

**Keywords:** Food Waste, Competitiveness, Consumer Behavior, Germany, Misshapen Fruits

### **1.0 Introduction**

Up to 40% of the globally produced food is lost or wasted every year (Monier et al. 2010; Gunders 2012). The waste occurs on farmers' fields, during processing and distribution as well as at consumers' homes (Gustavsson et al. 2011). Food waste has a negative impact on the environment and puts more pressure on limited resources such as land and water (Lipinski et al. 2013). Globally, the amount of land which is used for uneaten food sums up 1.4 billion hectares which is equivalent to nearly 30% of the global agricultural land use (FAO 2013a). These area could be used to tackle global challenges such as hunger or to protect resources and ecosystems (Göbel et al. 2012). It is estimated that 3.3 G tonnes of CO<sub>2</sub> equivalent are released to the atmosphere each year due to food waste. This makes food waste the third largest emitter of greenhouse gases after the USA and China (FAO 2013a). Therefore, it is important to find ways to reduce food waste and to develop more sustainable food value chains (Caronna 2011).

The German government as well as the EU Parliament have stated that they would like to see a significant reduction of food waste by 2025 (European Parliament 2012). However, the authorities have not agreed concrete measures to reduce food waste (WWF 2015). The difficulty lies on the complexity of food value chains which are integrated by several stakeholders with different sizes, power of negotiation, and objectives. In addition, there is a lack of communication along the supply chain. To start changing this there is a need for a holistic approach and a strong player to take responsibility.

There are some measures that could be taken to reduce food waste and to help educate the consumer of tomorrow. One of these solutions could be the additional offer of fruits and vegetables with flaws in retail stores. In industrialized countries such as Germany, retailers and partly the government set market standards for the visual appearance of fruits and vegetables. Retailers reject those fruits or vegetables that do not match this visual criteria. Most of the produce that gets rejected are perfectly fine for human consumption (WWF 2015).

While a lot of food is wasted globally, 925 million people suffer from malnutrition. According to FAO, about 200 million people could be nourished with the amount of food wasted in Europe. In addition, the saving of just one quarter of the globally lost or wasted food could feed 870 million people worldwide (Dewitz 2015). With an increasing global population there is a huge challenge to meet the food requirements of an estimated population of 9 billion by 2050.

Within this context, FAO and the WWF have recommended to reconsider the practice of high aesthetic standards (FAO 2013b).

Since 2008, retailers within the EU are allowed to offer imperfect fruits and vegetables. However, in Germany, fruits and vegetables with flaws are still not sold in retail stores (Kreutzberger & Thurn 2011). German supermarket chains argue that consumers are not willing to buy these imperfect fruits and vegetables and therefore stick to their market standards. However, existing studies suggest that consumers in Germany might be willing to buy imperfect fruits and vegetables. In addition, French consumers have accepted imperfect fruits and vegetables offered by domestic retailers (Intermarché 2015).

The specific objectives of this study are as follows: first, to explore the attitudes of German consumers towards fruits and vegetables with cosmetic flaws; and second, to unveil how these attitudes influence consumers' purchase intentions. With this understanding, this research aims at clarifying the potential of Corporate Social Responsibility strategies that might bring benefits to several stakeholders within the food chain.

### 2.0 Food Waste and Food Loss

The terms "food loss" or "food waste" describe edible parts of plants and animals which were produced or harvested for human consumption but in the end are not consumed by people (Lipinski et al. 2013). Food waste as well as food loss are not limited to one stage of the food supply chain (FSC). Figure 1 shows some of the reasons for food waste at a different stages of the FSC.

Figure 1 Food loss and waste along the FSC

	Production / Harvest	Handling and Storage	Processing and Packaging	Distribution and Market	Consumption / Household
<b>Definition</b>	During or immediately after harvesting	After produce leaves the farm for handling, storage and transport e.g. edible food eaten by pests, produce is degraded by fungus or disease	During industrial processing and/ or packaging	During distribution to markets, including losses at wholesale and retail markets	Losses in the home or business of the consumer, including restaurants/ caterers
<b>Reason</b>	e.g. Fruits are bruised during picking or threshing, Crops are sorted out for not meeting quality or market standards, crops are left on the field due to sharp drops in prices	e.g. edible food eaten by pests, produce is degraded by fungus or disease	e.g. Spoilage, edible fruit or grains are sorted out as not suitable for processing	e.g. foodstuff is sorted out due to quality, expired before being purchased, spillage or damage in market	e.g. quality, food purchased but not eaten

Source: based on Lipinski et al., 2013 and Bagherzadeh et al., 2014.

The terms “food waste” and “food loss” are often used as synonyms (Koivupuro et al. 2012). In general, food loss is described as agricultural goods that were produced with the intention to be consumed by humans but were discarded or lost due to insufficient quality (FAO 2014a). Food loss also refers to crops which were lost before harvest due to adverse weather conditions, pest, and diseases (Kantor et al. 1997). Most publications are consistent that food loss mainly occurs in developing countries and generally takes place in the early stages of the FSC (FAO 2014b). In contrast to “food loss”, “food waste” is described as food which was intended to be consumed by humans but instead was discarded after it expired or was spoiled because of negligence. This mainly occurs in industrialized countries at retail and consumer levels (Parfitt et al. 2010).

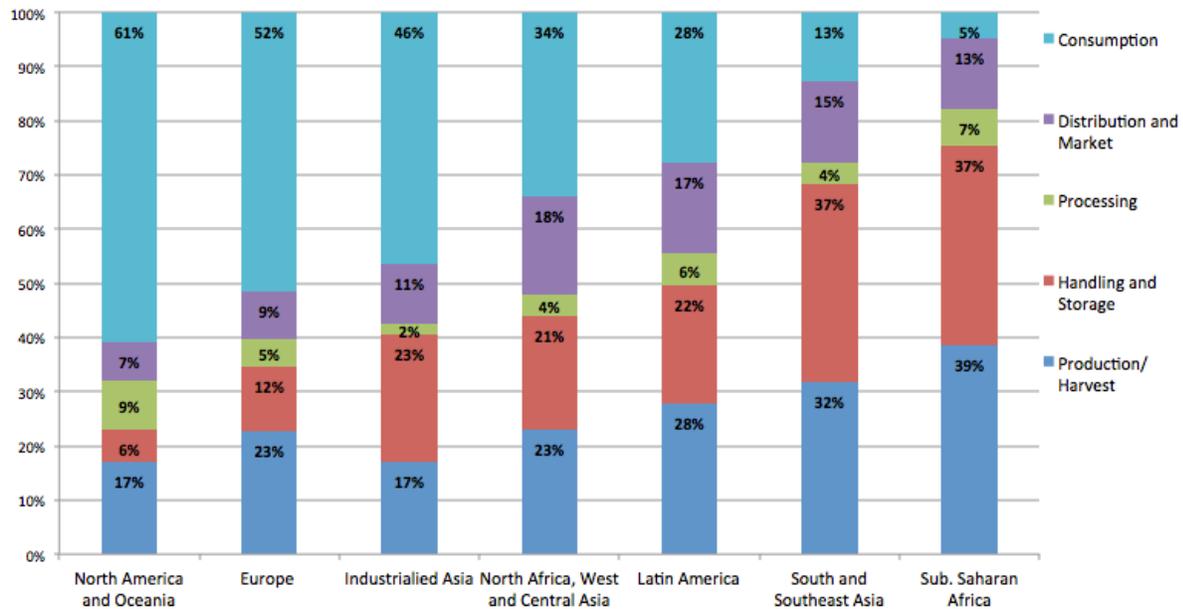
The above definitions have been criticized for not considering alternative uses for food such as animal feed or biofuel (Stuart 2009). The different definitions and demarcations create a barrier for understanding and identifying the causes and extent of food waste and loss. In order to solve this problem, the High Level Panel of Experts on Food Security and Nutrition (HLPE 2014) suggests the following definition:

*“Food loss and waste (FLW) refers to a decrease, at all stages of the food chain from harvest to consumption in mass, of food that was originally intended for human consumption, regardless of the cause.”* (HLPE 2014)

The HLPE definition will be adopted by this research.

Multiple studies (Beretta et al. 2013; Lebersorger & Schneider 2011) divide food waste into two categories “avoidable” and “unavoidable food waste”. Avoidable food waste refers to food which was perfectly edible without any restrictions before it was thrown away. In contrast to this, unavoidable food waste is classified as food which is thrown away because it is not edible under normal circumstances. This includes parts of foodstuff such as meat bones (WRAP 2009). The amount of food wasted varies between different countries. In developed countries, 280 kg to 300 kg of food are wasted and lost per capita per year. In less developed countries, 120 kg to 170 kg are wasted per capita per year (Gustavsson et al. 2011). Not only the amount, but also the place within the FSC at which FLW occurs varies between countries. While in developed countries about 40–50% of the total FLW occurs during production, handling/storage, packaging and processing as well as at the market stage, about 50–60% of the total FLW is generated at the household or consumption level. As opposed to this, 65–95% of the total FLW in developing countries is generated at the production, handling and storage as well as packaging stages and 5–35% is wasted at the consumers’ level (figure 2) (Lipinski et al. 2013).

**Figure 2** FLW by region and stage of the FSC

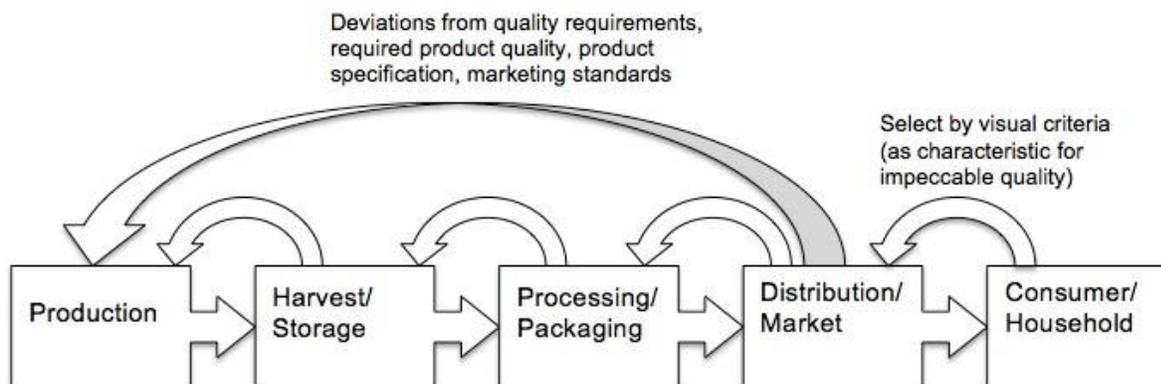


Source: Lipinski et al., 2013

Germany is the second largest contributor of FLW in the EU. However, in relation to the population of EU member countries, Germany has a FLW of 126 kg per capita, which is below the EU average of 186 kg per capita (BCFN 2012).

According to a study by the WWF (2015), 18 million tonnes of foodstuff are wasted in Germany along the whole FSC, of which 9.9 million tonnes are classified as avoidable. Moreover, foodstuff worth the retail price of 1.2 billion Euros is lost or wasted in Germany every year (Göbel et al. 2012). Retailers and consumers are mainly responsible for the accumulating of this food waste. Supermarkets set quality or cosmetic standards according to the criteria by which consumers select fruits and vegetables. This is illustrated in figure 3.

**Figure 3** Disclosure of market standards



Source: Göbel et al., 2012

In addition to market standards, “sorting guidelines” allow a classification into three categories Extra class, Class I and Class II. This classification takes into account the natural variations (shape, color, size) and provides the basis for setting prices (BLE 2013).

There have not been any specific market standards for most fruits and vegetables sold in the EU since 2009. However, producers can voluntarily classify their products according to the UNECE standards. The UNECE standards are very similar to the former EU standards and are not helping to tackle food waste (Schlegel-Matthies 2012; Kreutzberger & Thurn 2011).

The problem of fruits and vegetables which are wasted because of cosmetic flaws is present and repeatedly mentioned in the literature and press (Bagherzadeh et al. 2014). Several examples can be found in the US, the UK and Germany (NRDC 2012; BBC 2015; WDR 2015). Recently, some supermarkets in the UK, Canada, the US and France have started to sell fruits and vegetables with deformity (The Telegraph 2015; Handelsblatt 2013). One of the most successful campaigns in promoting fruits and vegetables with deformity is run by the French supermarket chain “Intermarché” which sells non-calibrated and imperfect fruits and vegetables 30% cheaper (Intermarché 2015). These kind of initiatives have not been adopted by supermarkets in Germany.

German supermarket chains argue that German consumers are not willing to buy this kind of fruits and vegetables and therefore stick to their market standards (Handelsblatt 2013). Various surveys and consumer studies show that the consumers are potentially willing to buy these fruits and vegetables if they are offered to them (NABU 2014). However, critics argue that these surveys results are not reliable (WDR 2015).

There are various approaches to reduce FLW (FAO 2013b; Kreutzberger & Thurn 2011; WWF 2015). A very important aspect which has to be understood in order to approach FLW reduction is that all actors in the FSC need to be actively involved in order to get satisfactory results (Lipinski et al. 2013). An important approach to reduce FLW in developed countries is to raise awareness. On the one hand, this is the responsibility of the government which can raise public awareness through education in schools and political initiatives (BMEL 2015). On the other hand, retailers have the possibility to raise awareness through marketing campaigns and in-store initiatives (Gustavsson et al. 2011).

The problem of food waste is unlikely to be solved without considering the impact of Corporate Social Responsibility (CSR) and Consumer Social Responsibility (CNSR). With the ongoing globalization as well as the growing power and influence of corporations over the last decades, society, governments and stakeholders started to expect corporations to take responsibility for social and ecological issues (Porter & Kramer 2006; Bassen et al. 2005). CSR has been used as a source of competitive advantage but soon might become a threshold capability (Carroll & Shabana 2011). Several studies suggest that CSR activities mainly result in sustainable competitive advantages and market opportunities (Hartmann 2011; McKinsey 2010; Bhattacharyya 2010).

The expectations on companies to pursue CSR vary according to the sector’s impact on economic, social and environmental issues (Hartmann 2011). The food sector does not only depend on natural resources but also has a significant impact on the environment. Simultaneously, it is connected to various societal concerns, such as animal welfare or labor

rights (Hartmann 2011). Furthermore, the public awareness has grown towards ethical and safety issues related to the procurement processes due to the risk of unfair practices, power abuse and food scandals. These circumstances result in the fact that the food sector tends to be the target of requests by NGOs, activists and the government (Hartmann 2011).

The rising importance of CSR in the food sector led to the result that a majority of leading food companies implemented a CSR strategy (REWE 2015; ALDI 2015). The example of the campaign the “inglorious fruits and vegetables” by the French supermarket Intermarché shows how the offer of fruits and vegetables with cosmetic flaws was used to create a successful CSR strategy. The supermarket has created awareness for fruits and vegetables with flaws, which in the end helps farmers who sell fruits and vegetables that would normally be thrown away, reducing food waste (Intermarché 2015).

Many authors emphasize the importance of CSR. However, various articles criticize that the importance and the role of the consumer in achieving CSR is not discussed or taken into account in most of the publications on CSR (Caruana & Chatzidakis 2013). Vitell (2014) states that it is difficult for businesses to have a successful CSR strategy without the support of the consumer. Therefore, CSR has to be complemented by CNSR.

Devinney et al. (2006) define CNSR “as the conscious and deliberate choice to make certain consumption choices based on personal and moral beliefs“. The authors stress that an “ethical” and a “consumerism” component, are two basic components to understand CNSR. The “ethical” component relates to the fundamental significance “of the non-traditional and social components of a company’s products and business processes“. The consumerism component “implies that the preferences and desires of consumer segments are partially responsible for the increasing influence of ethical or social factors“. However, it has to be beard in mind that in reality, the consumer acts differently and not necessarily according to their attitude. Devinney et al. (2006) express this by saying “Consumers are not willing to put their money where their mouth is”.

The findings of the study by White et al. (2012) support Devinney’s theory. The researchers used fair trade products to show that the positive attitude of consumers towards socially responsible products is not necessarily consistent with their shopping behavior. The reason for this was among others that the consumers were not fully aware of how the purchase of fair trade products can offset an economic injustice. However, the study also shows that purchases of fair trade products can be increased when the social benefits of these products are communicated to the consumers (White et al. 2012). Bearing this in mind, corporations need to be aware of the complexity of the decision making process and social purchasing in order to take actions and educate consumers (Devinney et al. 2006).

Studies show that German consumers have become more aware of the environment over the years, which is reflected in their purchasing habits (BMEL 2014). However, the price is still the most important factor when it comes to grocery shopping. According to a study of Nielsen (2013), more and more German consumers tend to buy reduced products due to rising food prices. Consumers who tend to buy organic and environmentally friendly products tend to have a higher income and a better education (BMEL 2013).

### 3.0 Methodology

Post positivism was selected as the most suitable research philosophy to meet the research objectives of this study. It is an appropriate method to understand the causes that determines effects or outcomes.

In order to gain a more complete understanding of the research problem, this study has used deductive reasoning. Quantitative data was collected to test formulated hypothesis. A survey was administered to 213 consumers to unveil their attitudes and opinions towards food waste and fruits and vegetables with flaws. All participants were Germans. The criterion used for selecting respondents was that they purchase food and are active on social media.

A pilot test with eight people helped to refine and improve the survey. The study participants were asked 35 questions. The data collection started in July 2015 with the pilot test and the rest of the survey was conducted during November and December 2015. Respondents' anonymity and privacy has been strictly preserved.

The structured questionnaire used in this study was created and conducted with the online service tool Survey Monkey. This strategy enabled to collect quantitative data from German consumers with a diverse social and educational background. However, this strategy has its limitations due to the risk that a certain age or gender group is stronger represented than others.

Nominal as well as ordinal scales were used to gather data. Most responses were reported on a five-point Likert scale. Graded answers have allowed respondents to provide a more precise answer. This has helped the researchers of this study to understand respondents' attitudes and potential consumption trends.

Collected data was analyzed using Social Science Statistics and tools provided by the survey platform. These two approaches have allowed to perform a descriptive and inferential analysis of raw data. The Mann-Whitney U test has been used to test the null hypothesis.

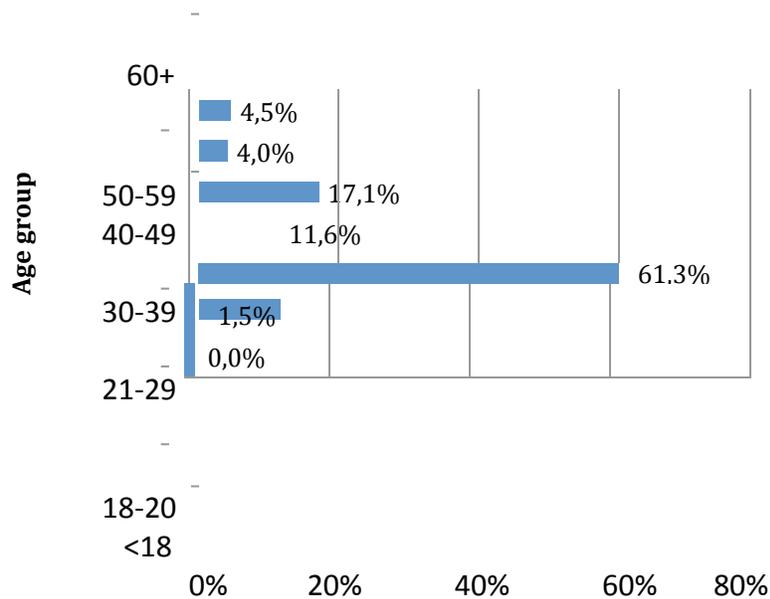
### 4.0 Research Findings and Discussion

Table 1 and figure 4 provide some demographic information on the study participants.

**Table 1** Gender of the study participants

Gender	n	%
Female	121	56.8
Male	92	43.2

**Figure 4** Age range of the study participants



The majority of respondents had a university degree of which 30% had a Bachelor degree and 48% had a Master or higher degree. 20% stated that their highest education level is Abitur. This indicates that the educational level of the participants was relatively high.

60% of the participants had € 2000 or less per month at their disposal. 40% had more than € 2000 at their disposal.

### ***Shopping Behavior***

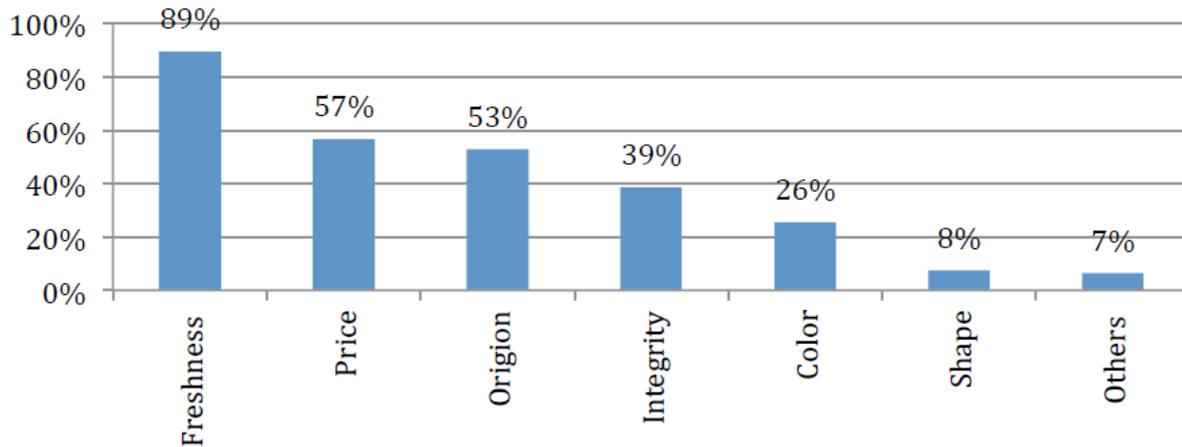
The interviewees were asked six questions about their shopping behavior. 71% of the respondents buy their groceries in the supermarket and 18% in discount shops. Only 8% do their groceries in small retail shops or farmers' markets. None of the participants do online food shopping. 1% do not do their grocery shopping.

The majority of respondents (92%) stated that they buy fruits and vegetables at least once a week. The remaining participants buy fruits and vegetables every day (4%), monthly (4%) or never (1%). Findings suggest that fruits and vegetables are an important component of the respondents targeted in this study.

Respondents were asked about the importance of organic in the decision making process. For 22% of them, it is very important that the food they buy was produced organically. 63% answered that it is relatively important and 16% stated that it is not important. However, only 2% claim to buy exclusively organic. When asked about how often they buy organic products, 36% stated that they buy organic products frequently and 53% claimed to buy organic stuff occasionally. 18% of the participants never buy organic food. Collected data indicates that for most participants, organic products play a moderate role in their buying behavior. This corresponds with the literature findings (BLE 2012).

Figure 5 presents the results of question six which aims at unveiling the respondents' main criteria for choosing fruits and vegetables.

**Figure 5** Choosing criteria for fruits and vegetables

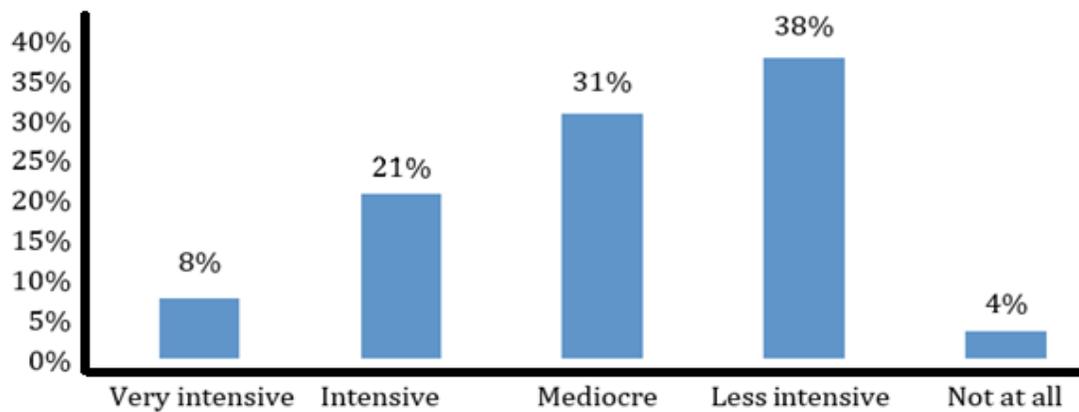


Findings suggest that the most important criterion for fruits and vegetables selection is freshness (89%), followed by price (57%) and origin (53%). The color (26%) as well as the shape (8%) of the products do not seem to be very important criteria for targeted participants. 7% named their own criteria such as smell, seasonality and ripeness. Not surprisingly, price and origin play an important role during the decision making process. This is in line with former findings of German consumer studies that suggest that German consumers are very price sensitive. Interestingly, shape and color do not seem to play a relevant role for those consumers targeted in this study. Both are criteria usually regulated by market standards. This leads to the assumption that consumers do not consider these criteria as there are usually no differences in shape or color in supermarkets.

***Knowledge, Awareness and Importance of Food Waste***

Figure number six provides some information on participants' attitudes about food waste.

**Figure 6** Level of intensity with which consumers deal with the topic of FLW

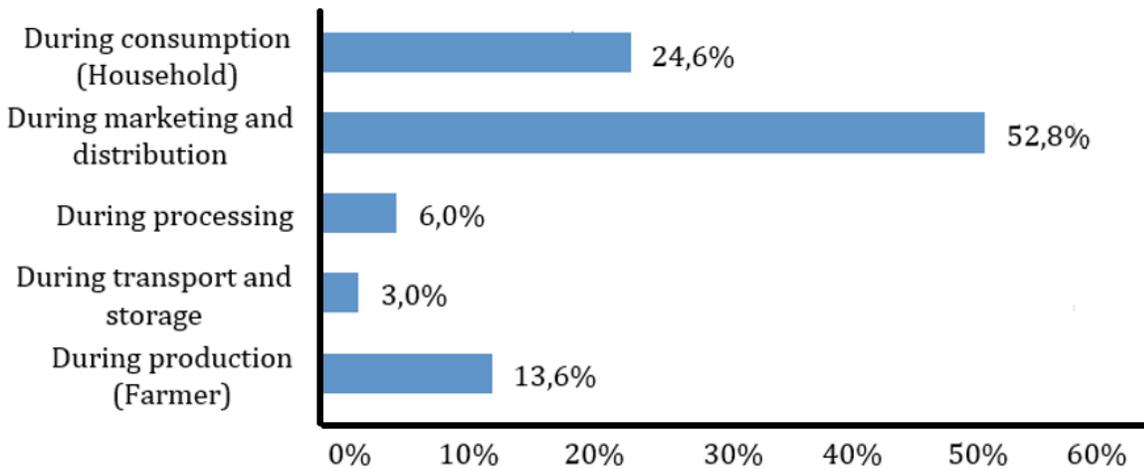


The data collected suggest that the general topic of food waste has a very modest importance for the consumers targeted in this study. However, on a personal level findings show a different outcome. 40% of the participants alleged that it is “very important (1)” not to waste food; 36% that it is “important (2)”; 18% that is “relatively important (3)”; 5% that is “relatively unimportant (4)” and 1% “unimportant (5)”. The median of 2 (important) shows positive tendency towards the importance of not wasting food.

Results also indicate that respondents believe they could reduce food waste. 55% claimed that they could “definitely (1)” (30%) or “very likely (2)” (25%) waste less food; 22% claimed they could “probably (3)” waste less and 23% say that they could “probably not (4)” or “definitely not (5)”. The median of 2 (very likely) shows that consumers believe they could waste less food. On a personal level, they claimed that they try not to waste food, but at the same time, they claimed that they could waste less food.

To explore participants’ understanding of food waste, respondents were asked at which point of the food supply chain most food is wasted in Germany. Results are illustrated in figure 7.

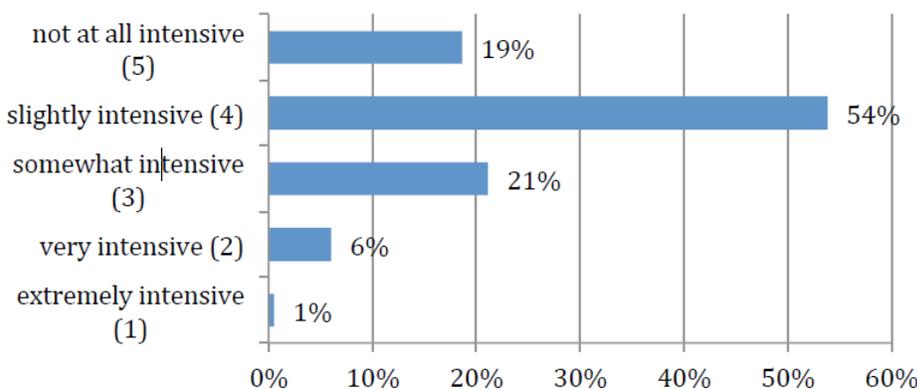
**Figure 7** Consumers' opinion on where most FLW is generated



Respondents expressed mixed views on where most FLW is generated. Most participants (53%) believe that most food waste occurs at the distribution level or at the supermarkets. However, most food waste in Germany is generated at the household level. Only 25% of the participants were aware of this. Results of this quantitative study reveal that most German consumers are not well-informed when it comes to understand FLW. Interestingly, they do not see themselves as the main contributors of food waste even though most of them say that they could waste less food.

According to this study, a majority of participants perceive that the topic of FLW has not received the attention it deserves either by the media or the government. Figure eight presents this information.

**Figure 8** Intensity with which consumers perceive the topic of FLW



Findings also indicate that the majority of participants think the topic should “definitely” (48%) or “very likely” (33%) be thematised by the media and/or politics. 15% said the topic should

“more likely” be thematised. The remaining participants said it is “unlikely” (4%) or “extremely unlikely” (1%) that it should be more thematised.

**Market Standards for Fruits and Vegetables**

54% of respondents mentioned that consumers would not buy fruits and vegetables with cosmetic flaws. They subscribe to the retailers’ opinion as stated in the literature review. 24% say that this kind of fruits and vegetables does not fit with the image of German supermarkets. 17% believe these kind of fruits and vegetables are not sold due to governmental regulations. Other reasons were: “there are not enough of them” (2%) or there wouldn’t be an extension of the standard offer (1%).

Respondents were further asked to express their thoughts about who is responsible for setting market standards. Results are illustrated in table two.

**Table 2** Consumers’ valuation of the responsibility for market standards

	Answer	Respond rate
1.	Supermarkets set market standards to regulate the appearance of fruits and vegetables. There are no legal	19%
2.	Supermarkets set market standards to regulate the appearance of fruits and vegetables have to look. Apart from that, there are legal restrictions for <u>some</u> varieties of fruits and vegetables regarding their appearance.	53%
3.	Supermarkets set market standards to regulate appearance of fruits and vegetables. Apart from that there are legal restrictions for <u>all</u> varieties of fruits and vegetables regarding their appearance.	18%
4.	Supermarkets do not set market standards to regulate the appearance of fruits and vegetables. However, there are legal restrictions for <u>all</u> varieties of fruits and vegetables regarding their appearance.	10%

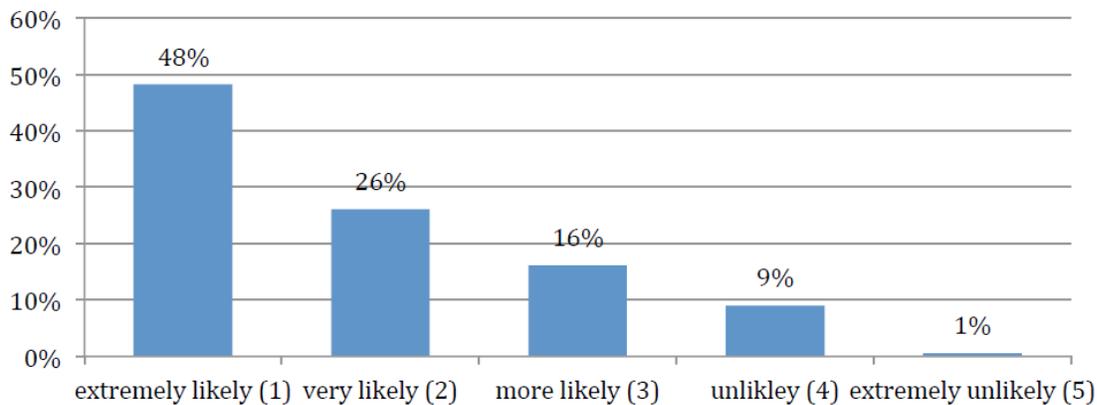
The findings revealed that 47% of participants do not seem to know who is responsible for market standards. Most of the participants know that there are regulations set by the supermarkets, but there seems to be uncertainty in which way the government influences market standards.

### Fruits and Vegetables with Cosmetic Flaws

The findings revealed that most respondents (91%) believe that food waste could be reduced if fruits and vegetables with cosmetic flaws were offered in supermarkets. Moreover, 85% of participants would support those supermarkets that decide to relax their rules around imperfect fruit and vegetables.

In line with previous studies, the majority of targeted consumers claimed they would buy fruits and vegetables with flaws. Participants' answers are presented in figure nine.

**Figure 9** Consumers' willingness to buy misshaped fruits and vegetables



The research further explored respondents' positive and negative attitudes towards misshaped fruits and vegetables. Those participants who had a positive attitude, would purchase misshaped fruits and vegetables because: they believe there are no quality differences with flawless fruits and vegetables (62%); they can help reduce the amount of food waste (20%); they think these products look more natural (12%) and 6% answered "others".

Those participants who would not buy fruits and vegetables with cosmetic flaws justified their answer as follows: 36% mentioned they do not look nice, 26% fear they could turn bad more quickly, 21% said they fear that they do not taste good, 5% said they are harder to peel, 5% said they are not used to these kind of fruits and vegetables and 5% said they simply prefer flawless fruits and vegetables. The distribution of the answers shows a clear uncertainty about fruits and vegetables with flaws.

In order to understand consumers' perceptions towards fruits and vegetables with cosmetic flaws and how much they would prepare to pay for them, pictures of carrots and potatoes with flaws were shown to participants.

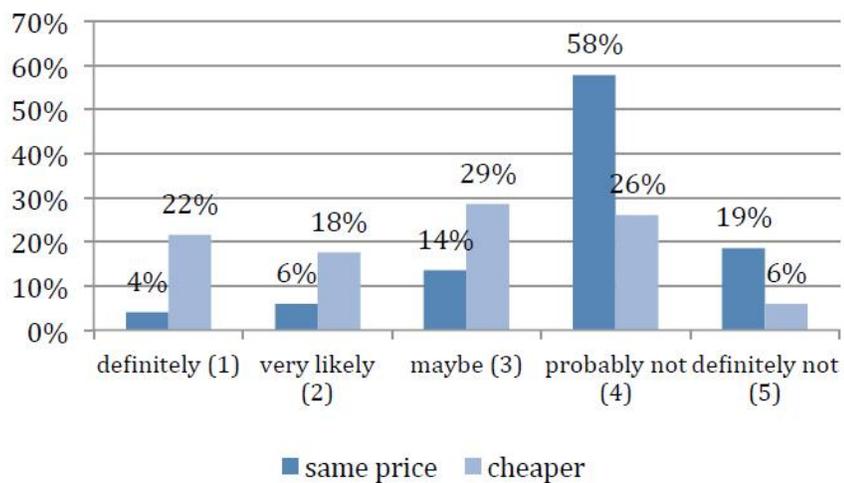
**Figure 10** Connation



Connations are very distinct cosmetic flaws. However, most participants responded positively: 27% would “definitely” buy these vegetables and 27% would “very likely” buy them for the same price as flawless vegetables. 22% were not sure if they would buy them for the same price. 21% of the participants would “probably not” buy them and 4% would “definitely not” buy them.

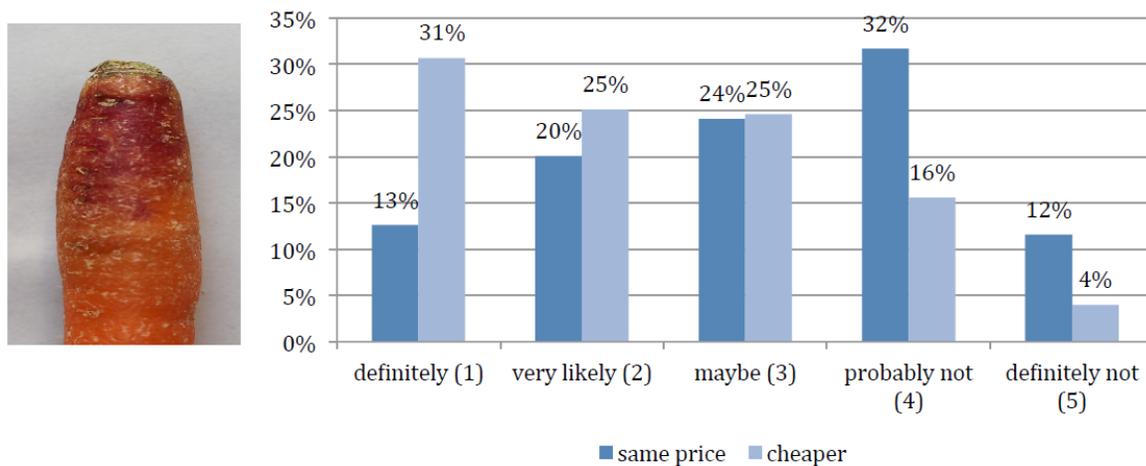
The distribution of the answers changes strongly when the participants were asked if they would buy it when the products are cheaper than flawless vegetables. In this scenario, the percentage of respondents who would buy the vegetables more than doubled. 66% would definitely buy them and 21% would very likely buy them. Also, the percentage of people who would “probably not” buy them dropped sharply from 21% to 3%.

**Figure 11** Willingness to buy vegetables with cicatrisations



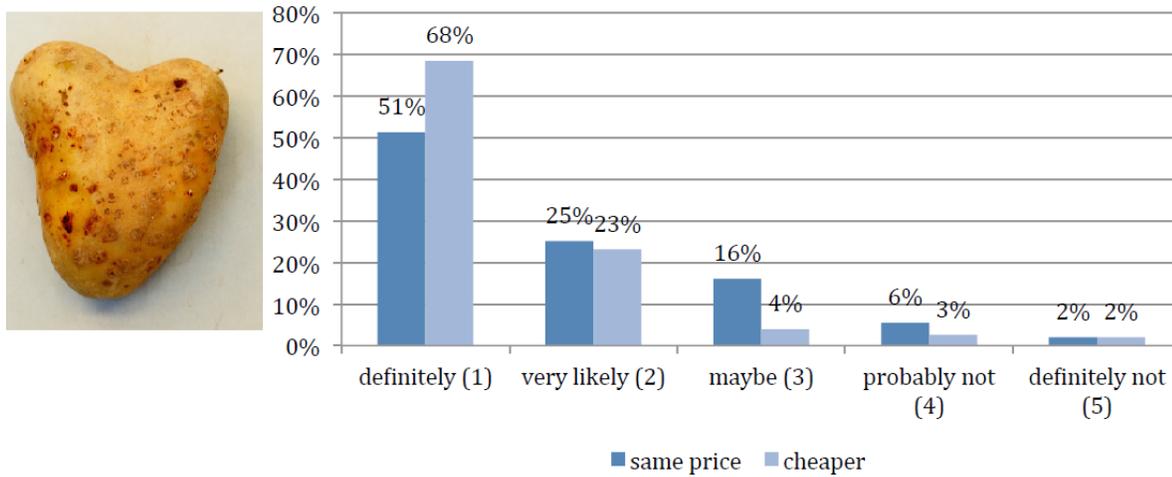
Findings changed when participants were shown a vegetable with a strong cicatrisation. Figure 11 shows that the majority of people would not to buy vegetables with this kind of flaws. 58% would “probably not” and 19% would “definitely not” buy these vegetables for the same price. With a median of 4, the tendency is clearly negative. The distribution changes when the participants were asked if they would buy them for a cheaper price. 22% in contrast to 4% would buy the vegetables “definitely” and 18% in contrast to 6% would buy them “very likely”. 29% would maybe buy them, which is 15% more than before the price reduction. The percentage of people who would “probably not” and “definitely not” buy them decreased strongly. The median changed to 3 (maybe), which indicates a slightly positive tendency. However, this shows a clear uncertainty regarding the willingness of consumers to buy vegetables with this kind of flaws.

**Figure 12** Willingness to buy vegetables with discoloration



Compared to other cosmetic flaws, discoloration is a less distinct flaw. However, figure 12 shows that only 13% would buy vegetables with discoloration “definitely” and 20% very likely. Again, the willingness to buy vegetables with aesthetic flaws changes if there is a reduction in price. The median changes from 3 (maybe) to 2 (very likely). 31% would “definitely” and 25% would “very likely” buy discolored vegetables if they were cheaper. In this case, the change of the percentage between the answers “definitely” and “probably not” is striking as they decreased respectively by half. A positive tendency is also recognizable by comparing the medians which changed from 3 (maybe) to 2 (very likely).

**Figure 13** Willingness to buy vegetables with deformations



In comparison to the carrots with cosmetic flaws, the potato with a deformation has the most positive feedback. One reason could be that the deformation is less distinct than the others. Another reason could be that the shape looks like a heart, which could create positive associations. Figure 13 shows that most respondents would buy this kind of potatoes even if there is no price reduction. When it comes to a price reduction, 68% would “definitely” buy the potato. The median for both questions is 1 (definitely), which clearly indicates a positive attitude towards this kind of visual flaw.

The analysis of data shows that the consumer has different attitudes towards different cosmetic flaws. It also reveals how price can strongly affect the acceptance of vegetables with cosmetic flaws. Interestingly, targeted consumers have provided contradictory answers. Respondents stated that shape and color do not affect their purchase decision process. However, once they were shown pictures of vegetables with flaws the clear positive tendency changed. A majority positive response was only achieved when the price was hypothetically lowered.

**Price, CSR and CNSR**

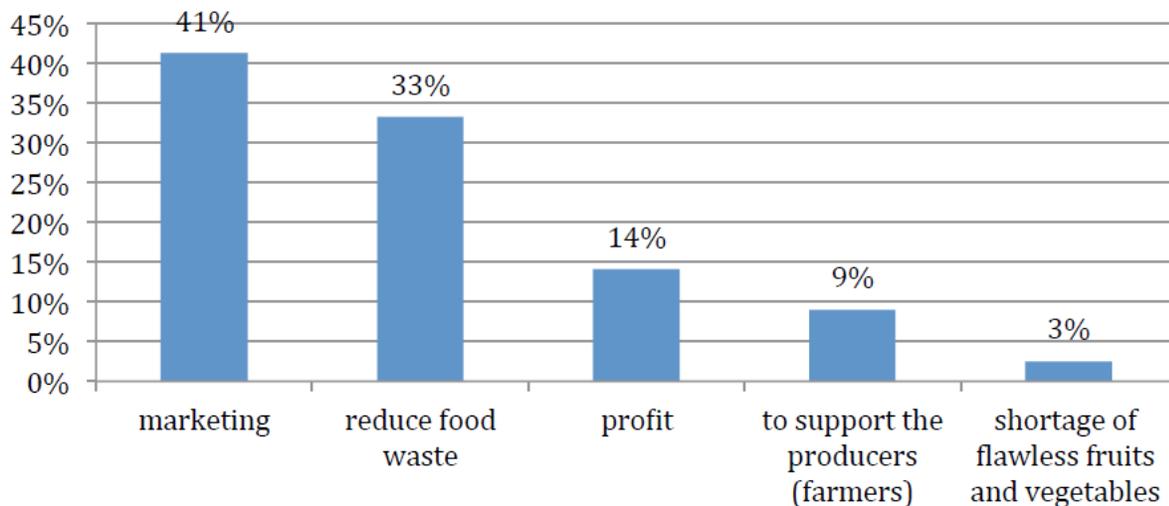
This research further explored how much cheaper fruits and vegetables with flaws should be compared to flawless crops. 21% said they should not be cheaper, 26% said they should be less than 10% cheaper, 37% said they should be 10 to 20% cheaper, 12% said they should be 20 to 30% cheaper and 2% said they should be more than 30% cheaper. In summary, a price reduction of these fruits and vegetables is necessary to convince consumers to buy them. Most of the participants see a reduction up to 20% as appropriate.

Respondents were asked whether they would buy fruits and vegetables with cosmetic flaws for the same price as flawless if they had the certainty that a purchase reduces food waste. The response shows a positive tendency (median 2): 35% answered “definitely (1)”, 30% said “very

likely (2)", 23% said "maybe (3)", 10% answered "probably not (4)" and 2% "definitely not (5)". Based on the preceding findings, which show that these consumers are very price sensitive, it is doubtful that this would apply in practice. However, it shows that the participants react positively to the attribute of a product which reduces food waste.

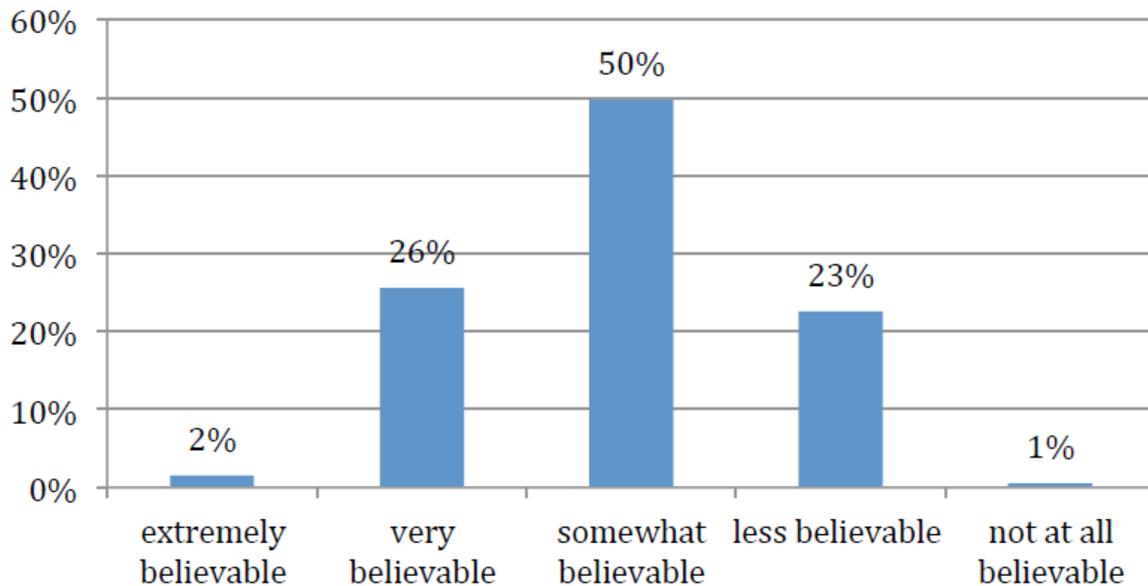
Consumers were suspicious of the reasons for supermarkets, in other countries, to offer food and vegetables with cosmetics flaws. Figure 14 shows that 41% believe that supermarkets offer fruits and vegetables with flaws due to marketing reasons. 33% think that they offer them to reduce food waste. The rest think the main reasons are profit (14%), to support producers (9%) or due to a shortage of flawless fruits and vegetables (3%). If the categories "marketing" and "profit" are combined as well as the categories "to reduce food waste" and "to support producers" it can be said that 55% of the participants think supermarkets offer fruits and vegetables because of self-interest in contrast to 42% who think they do it because of social responsibility.

**Figure 14** Consumers' perception of supermarket reasons to offer misshaped fruits and vegetables



Respondents were also asked (Figure 15) to share their opinion about how believable they think it is for supermarkets to offer fruits and vegetables with flaws in order to reduce food waste. Findings indicate that most respondents think it is "somewhat believable", which indicates that they are not fully convinced whether to trust such a campaign or not. However, the data shows a slight positive tendency, which indicates that consumers' trust could be gained.

**Figure 15** Level of credibility of supermarkets offering misshaped fruits and vegetables to reduce food waste



#### 4.1 Inferential Data Analysis

Mainly Likert-type questions were used in the questionnaire. Therefore, a nonparametric test such as the Mann-Whitney U test seems appropriate to analyze ordinal data.

In case of a small sample size, a U statistic is calculated. With the help of a table of critical U values, it is checked whether the hypotheses are accepted or rejected depending on whether the value is bigger or smaller than the critical value. In studies with large sample sizes, the value of U is approximately normally distributed (Black, 2010). In this case, a z score is calculated from U. If the z score is greater than 1.96 or less than -1.96, the null hypothesis is rejected (Black, 2010). Due to the large sample size of this study, the z score will be used to test the hypotheses which are listed in table three.

**Table 3** Research Hypothesis

Hypothes	H0	HA
1	The willingness to buy fruits and vegetables with flaws of male and female consumers is	The willingness to buy fruits and vegetables with flaws of male and female consumers is not
2	The willingness to buy fruits and vegetables with flaws of people who buy organic products regularly and do not buy organic products regularly	The willingness to buy fruits and vegetables with flaws of people who buy organic products regularly and do not buy organic products regularly is not
3	The intensity of how detailed male and female consumers are exposed to the topic of food is	The intensity of how detailed male and female consumers are exposed to the topic of food is
4	The willingness to buy fruits and vegetables with flaws of people who are younger than 30 and who are older than 30 is	The willingness to buy fruits and vegetables with flaws of people who are younger than 30 and who are older than 30 is not
5	The willingness to buy fruits and vegetables with flaws of people who are exposed to the topic of food waste intensively and people who are not exposed to	The willingness to buy fruits and vegetables with flaws of people who are exposed to the topic of food waste intensively and people who are not exposed to
6	The willingness to buy fruits and vegetables with flaws of people who have an income below £2000 and people who have an income of more than £2000 is	The willingness to buy fruits and vegetables with flaws of people who have an income below £2000 and people who have an income of more than £2000 is

**Table 4** Mann-Whitney U test results

Hypothesis	z-score	Decision
1	-2.614	Reject H0
2	0.0838	Accept H0
3	-1.4051	Accept H0
4	-1.1945	Accept H0
5	-3.7824	Reject H0
6	-2.299	Reject H0

*Hypothesis 1*

The test results show that the null hypothesis (H0) was rejected. This indicates that there is a difference in the willingness to buy fruits and vegetables with flaws between male and female consumers. This is confirmed by the examination of the sample data. It shows that women tend to be more willing to buy fruits and vegetables with flaws.

#### *Hypothesis 2*

The null hypothesis of hypothesis 2 was accepted. Therefore, it can be concluded that the willingness to buy fruits and vegetables with flaws does not depend on whether a customer buys organic food regularly or not.

#### *Hypothesis 3*

The descriptive analysis showed that the participants were hardly exposed to the topic of food waste. The results of the Mann-Whitney U test show that the intensity of how detailed male and female participants were exposed to the topic of food waste is identical.

#### *Hypothesis 4*

The hypothesis test shows that the willingness of people younger than 30 and who are older than 30 is identical. Therefore, it can be said that age has no influence on the willingness to buy fruits and vegetables with flaws.

#### *Hypothesis 5*

The hypothesis testing and the examination of the sample data showed that people who were exposed to the topic of food waste intensively tend to be more willing to buy fruits and vegetables with flaws than people who were not exposed to it intensively.

#### *Hypothesis 6*

People who have less than € 2000 income per month tend to be more willing to buy fruits and vegetables with flaws in contrast to people who have more than € 2000. This result can be interpreted as the more income consumers have, the less willing they are to buy fruits and vegetables with flaws.

The research at hand focuses on the FLW which occurs due to aesthetic standards for fruits and vegetables set by retailers. The lack of information makes it difficult to estimate the exact amount of food that is wasted because of these standards. However, based on the definition that food is classified as wasted as soon as it loses the purpose to be consumed by humans and due to the information found in the literature it can be stated that aesthetic standards are a great source of food waste with a huge potential to be avoided.

To reduce food waste retailers and consumers have to work together to overcome the habits which hinder selling and buying of misshaped vegetables and fruits. In addition, governments can play an important role as they can provide consumers with information and influence the industry. In fact, food waste reduction is already part of the political agenda of the German

government (BMEL, 2015). This research revealed that most consumers do not perceive the topic of food waste in the politics and in the media. At the same time, they support the idea that food waste should be stronger thematised. Clearly, there is room for improvement in these areas.

Findings suggest that misshaped fruits and vegetables have a market potential in Germany when offered at a discount price. Without the appropriate incentives, consumers will not change their shopping behavior even though they claim that they would buy fruits and vegetables with flaws (Vitell, 2014). Retailers could offer products which are social and environmental friendly for lower prices than normal products. Nevertheless, it has to be noted that consumers react differently to various flaws. The survey shows that the willingness to buy vegetables with e.g. discoloration and cicatrisation is much lower than for other flaws. Therefore, the retailer has to adjust the aesthetic standards for fruits and vegetables.

This research has revealed that many consumers do not trust retailers. This shows that consumers need to be informed and sensitized by the supermarkets, which again leads to the fact that consumers' awareness has to rise. In other words, the supermarkets have to pay attention to CNSR.

Market standards are important to provide sound products. However, the aspect of standards related to the shape is questionable. In summary, it can be said that the offer of fruits and vegetables with flaws could be one initiative against FLW. However, for this strategy to work it requires government and supermarkets involvement. In a country like Germany where only fruits and vegetables without cosmetic flaws are offered, an "ugly fruit" initiative could generate a lot of positive feedback and attention which in turn gives a company a strategic advantage. A well done campaign would be exemplary and could increase the image of the company.

## **5.0 Recommendations**

This section elaborates recommendations derived from the primary and secondary collected data that may help stakeholders to reduce food waste.

There is a good opportunity for German supermarkets to adjust their market standards for fruits and vegetables. Supermarkets must consider consumers' attitudes towards differing flaws. The misshaped products should be 10 to 20% cheaper than flawless products.

Supermarkets, through marketing campaigns, can influence consumers' attitudes and purchasing behavior towards misshapen produce. The message must emphasize that cosmetic flaws do not reduce quality or have negative effects but help to reduce food waste. Retailers should not see the offer of misshapen produce as an opportunity to improve business finances. Instead, they should focus on CSR and how this strategy help them to improve the image of the company as well as developing a competitive advantage.

A successful government policy should consider the protection of the natural environment. Therefore, the government has a clear role in drawing attention to the dimensions and consequences of food waste. This can be achieved through education, television campaigns and information stands. Also, the government should set regulations to reduce and control food waste.

The above will make consumers aware that they are one of the main causes for market standards. Consumers need to understand they have a moral responsibility to help reducing food waste through conscious and sustainable consumption and shopping behavior.

### **6.0 Areas for Further Research**

Although this exploratory study has made progress in unveiling the attitudes of consumers towards fruits and vegetables with cosmetic flaws; and how these attitudes influence consumers' purchase intentions, a number of areas still deserve further attention. First, it would be valuable to investigate how much fruits and vegetables are wasted through aesthetic standards. For instance, it can be study if selling misshaped fruits and vegetables contribute to a food waste reduction. Furthermore, it has to be analyzed if and how much the producers benefit if misshaped produce are bought by retailers. Second, further research is needed to explore consumers' attitude towards fruits and vegetables with cosmetic flaws at the point of sale.

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